the star system 61 Cygni; discussion of M. Flammarion's latest papers on the subject.—On the repulsive power of comets, by G. V. Schiaparelli.—On the respiration of Fungi, by Herr Müntz.—On over-saturated solutions and the dissociation of salts in solution, by A. Tscherbatschew.—On forests, the courses of rivers, and atmospheric moisture, by L. Fautrat.—On the radiation of the sun; observations made at the Observatory of Montsouris, near Paris, by Marié-Davy.—On the time of reaction of the sense of taste at the tip of the tongue, by Herren M. v. Vintschgrau and J. Hönigschmied.—On colouring matters and the sensitiveness towards light of several silver salts, by H. W. Vogel.—On the decomposition of vegetable xanthophyll by light, by J. Wiesner.—On the circulation of ammonia in the atmosphere, by Herr Al. Schloesing.—On some glacier-phenomena in the Bavarian high plateaus; a communication made to the Munich Academy, by Herr Zittel.—Researches on the process of digestion in the intestines of sheep, by Eugen Wildt.—Some researches on magnetism, by M. Bouty.—On the antiseptic properties of salicylic acid; an extract from the *Journal für praktische Chemie*, by Herr Kolbe.—On the direct observation of the atmosphere of Venus, by C. S. Lyman; results of these observations show the horizontal refraction of Venus' atmosphere to be 44″·5; in 1866 it had been determined at 45″·3, and Mädler in 1849 had found it 43″·7. Mr. Lyman measured the diameter of the planet six times on Dec. 10 (the day after the transit), and found it on the average to be 63″·1; the average of eleven measurements on Dec. 11 was 63″·75.—On the electric action of a thermal source at Baden, Switzerland, by Herren Thury and Alb. Minich.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, March 15.—On the relation between differences of atmospheric pressure and velocity of wind, according to the theories of Ferrel and Colding, by Dr. Hann. The author begins with a review of the two theories of storms, the older of which has been accepted chiefly in Germany, the other in America and the Northern States of Europe. According to the former, whirlwinds are formed mechanically by different streams of air meeting, and centrifugal force causes the central depression. The more modern theory regards a local depression as the first condition, causing an indraught resulting in a whirlwind through the earth's rotation. The primary depression is held to follow condensation of vapour. Probably there is something right in each of these views. Eddies can, doubtless, be formed by currents meeting at certain angles, but the direction of rotation would not be invariable in each hemisphere. Besides, the mechanical resistance to the progress and continuance of a whirlwind so formed would, without inconceivably favourable conditions, be far too great to be overcome. Dr. Hann recognises the part played by vapour in storms, but thinks that many meteorologists rely too much on it in their need, and points to the works of Hopkins and Laughton for instances of this partiality. He believes that the greater part of the low pressure which accompanies storms must be explained by mechanical laws, and that the local differences of pressure in a cyclone or even in a straight-blowing current (if such there be) follow from movements of the air. Condensation may cause a depression, and that depression we know may cause winds which produce a depression ten or fifteen times greater. Prof. Ferrel endeavours to show mathematically that depressions are due to centrifugal force and the earth's rotation. Colding considers tropical hurricanes as true whirlwinds, and his values for pressure from centre to edge reckoned from this hypothesis agree with observation. Now, there is no reason why centrifugal force should not act in spirally-whirling storms in relation to radius and velocity. The earth's rotation adds to the effect of this force, and the result is a diminution of pressure towards the centre on the earth's surface. The enormous extent of some minima is thus explained, which an ascending current and precipitation fail to account for. Dr. Hann proceeds to develop mathematically the theories of Ferrel and Colding, and gives the following formula (1) for finding the barometric gradient:—

$$\Delta B = \frac{l}{287{\cdot}4} \cdot \frac{B}{T}(2n \sin.\phi + u)v$$

where B is the height of the barometer at point of observation, T the absolute temperature (*i.e.* $273° + t$), $l = 50$ geographical miles, u the angular velocity of rotation, n the angular velocity of the earth's rotation, ϕ the latitude, and v the distance traversed in unit of time. In this equation it is assumed that the circulation is simple, without friction, and not inducing new masses of air.—In the *Kleinere Mittheilungen* we have an article on Baumhauer's Meteorograph, and some extracts from a letter of Prof. Mohn, dated 21st December last, on cyclonic minima. In this letter the writer states that having called the attention of Herr Guldberg to the fact that Colding's point of view is quite different from that of the new school of meteorologists, that gentleman worked out his own formula and found as much agreement between his results and observations of an Antilles hurricane as Colding found by his method. The factors taken into consideration by Herr Guldberg were, barometric gradient, rotation of the earth, centrifugal force, and friction of the air. Prof. Mohn believes the central minimum to be a mechanical effect of rotation. He discovered lately that Prof. Ferrel had worked with similar formulæ and had derived therefrom similar results, but he intends to pursue his task, and believes it will be ascertained that relations of pressure are in great part functions of movement.

THE *Bulletin Mensuel de la Société d'Acclimatation de Paris* for February gives the customary yearly summary by M. Quihou of the principal experiments carried out in the Jardin d'Acclimatation in the Bois de Boulogne during 1874, and of the most important plants cultivated there.—M. Jeannel gives a report on various experiments conducted by him during the year in the Jardin de Luxembourg with the object of testing the value of mineral manures in horticulture.—The new kind of silkworm, *Attacus Yama-mai*, is the subject of a long paper by M. F. A. Bigot.—An attempt made by M. Victor Fleury to acclimatise the Siberian rabbit in France has not entirely succeeded, but excellent results have ensued in the crossing of this race with the common grey rabbit of the country.—The value of the *Eucalyptus globulus* in correcting the unhealthiness of marshy and other lands is proved by its effect in certain parts of Algeria, where, in the neighbourhood of Lake Fezzara, in Constantine, a large area of land hitherto noted for its insalubrity has greatly improved since the plantation of a large number of these trees.

Annali di Chimica applicata alla Medicina, Feb. and March, 1875.—These numbers contain the following papers:—On diastase and some preparations from malt, by H. Duquesnel.—On croton-chloral, by Engel.—On a carbonic solution of tribasic phosphate of lime, by Chevrier.—On a glycerine solution of iodide of potassium, by C. O. Barberis.—On the ventilation of closed localities, by G. P.—On vinic alcohol, aldehyde, and ethers: experimental researches made in the Physiological Laboratory of Padua, by Drs. P. Albertoni and F. Lussana.—On ferments and fermentations in the human organism, by A. Pavia.—On some fermentation processes by J. Macagno.—On a simple, easy, quick, and certain means to distinguish in mankind real death from apparent, by Dr. A. Monteverdi. This consists of injecting under the skin an aqueous solution of ammonia, and watching the appearance of the blister produced.—On blood fibrine and the formation of a substance analogous to ordinary albumen, by A. Gautier.—Researches on the parasite that produces whooping-cough, by Dr. Lebrerich.—On apomorphia, by G. Hirne.—A note on cremation, by the editor of the *Annals*, Dr. G. Polli.

THE *Gazzetta Chimica Italiana*, fasc. iii. 1875, contains the following papers:—On the action of acetyl chloride upon santonine and santonic acid, by F. Sestini.—On some derivatives from alphatoluic acid, by C. Colombo and P. Spica.—On the formation of sugar in fruits, by M. Mercadante.—On a new method of determining the tannic acid contained in wines, by A. Carpané.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, May 6.—Anniversary Meeting.—Dr. G. J. Allman, F.R.S., president, in the chair.—The officers of the Society were elected for the ensuing year as follows, viz.:—President, Dr. G. J. Allman, F.R.S.; Treasurer, Dr. J. Gwyn Jeffreys, F.R.S.; Secretaries: T. Currey, F.R.S., and St. George Mivart, F.R.S.; and as Members of the Council: Dr. J. D. Hooker, Pres. R.S.; Dr. J. G. Jeffreys, F.R.S.; Major-General Scott, C.B.; R. B. Sharpe, and Chas. Stewart, in the place of J. Miers, F.R.S., T. P. Pascoe, Major-General Strachey, F.R.S., Dr. H. Trimen, and the late D. Hanbury, F.R.S. The President then delivered an address on the History and Development of the Infusoria.

Anthropological Institute, May 25.—Col. A. Lane Fox, president, in the chair.—Mr. T. G. B. Lloyd read papers on

the Beothucs of Newfoundland, and on the Stone Implements of Newfoundland. The first paper was a continuation of one read the previous session, and contained the further experiences of the author in Newfoundland, which island he had recently revisited. The Beothucs possessed several of the characteristics belonging to many of the tribes inhabiting North America, whilst they differed from them in the following peculiarities:—Lightness of complexion, the use of trenches in their wigwams for sleeping places, the peculiar form of canoe, the custom of living in a state of isolation apart from the white inhabitants of the island, and their persistent refusal to submit to any attempts made to civilise them. They were also remarkable for their inability to domesticate the dog.—Prof. Busk communicated a paper on two Beothuc skulls, and described them as presenting all the characteristics of the normal brachycephalic form of the Red Indian skull.—In his second paper Mr. Lloyd described the stone implements he had brought from Newfoundland, consisting of axes, chisels, gouges, spear and arrow heads, scrapers, fish-hooks; also cores, flakes, whetstones, rubbing stones, sinkers, and stone vessels.—Mr. Park Harrison exhibited and described five photographs, from Tahiti, of Easter Island wooden tablets; and Mr. H. Taylor exhibited a series of fine photographs of people inhabiting the South Sea Islands.

Royal Horticultural Society, May 12.—Scientific Committee. A. Murray, F.L.S., in the chair.—The Chairman made a communication with respect to the acarus to which Prof. Thiselton Dyer had drawn attention as destroying the female flowers of the Yew. He believed it to be undescribed, and proposed for it the name of *Tetranychus taxi*. It was allied to the acarus which Prof. Westwood had described as very injurious to the young buds of the currant.—Mr. M'Lachlan exhibited specimens of wallflower in which the petals were virescent.—Dr. Masters showed leaves of the vine (from a nursery in the neighbourhood of London) bearing galls produced by Phylloxera.—Prof. Thiselton Dyer called attention to a paper by Dr. Franz Low, translated in the current number of the *Annals and Magazine of Natural History*. It described a nematoid worm (*Tylenchus Millefolii*), which produced the galls on the rachis of the leaves of the common Milfoil.—Prof. Thiselton Dyer exhibited three flasks which contained Pasteur's solution, all three of which had been subjected to boiling. The neck of No. 1 flask, treated on March 3, 1875, was plugged, while the contents were still boiling, with cotton-wool, and the fluid remains clear and unaffected. In flask No. 2, otherwise similarly treated, but without any plug, so that access of air and therefore of spores was allowed, there was a dense growth of mould (*Penicillium*). In No. 3, boiled on Sept. 30, 1873, but in which the plug was removed for five seconds only on Oct. 15, 1874, a dense mould had made its appearance.

General Meeting.—W. Burnley Hume in the chair.—Prof. Thiselton Dyer called attention to the principal objects exhibited.—A fine potful of the rare Irish Butterwort, *Pinguicula grandiflora*, was shown by Mr. Dean. *Senecio macroglossus*, an evergreen greenhouse climber shown by Mr. Green, had foliage identical with that of some forms of ivy; it was a native of the Cape.—A ripe fruit of *Stephanotis floribunda* was sent by R. T. Coombe, Taunton. Morels, which are abundant this year, were represented by a fine series of *Morchella crassipes*, sent by J. Barclay, The Durdans, Epsom.

Physical Society, May 22.—Prof. Gladstone, F.R.S., president, in the chair.—Mr. Spottiswoode, F.R.S., exhibited and described a revolving polariscope. A luminous beam passes from a small circular hole in a diaphragm through a polariscope, the analyser of which is a double image prism, the size of the hole being so arranged that the two luminous discs shall be clear of each other. If the prism be made to revolve rapidly, one of the discs revolves round the other and is merged into a ring of light, which is interrupted at opposite sides by a dark shaded band, the position of which depends upon the position of the original plane of polarisation. The discs may be coloured by inserting a selenite plate, and the rapid revolution of the analyser then gives alternating segments of complementary colours; or, if a quartz plate be used, the rotating disc passes successively twice in a revolution through all the colours of the spectrum, and when the revolution is rapid, merges into a prismatic ring. The effect of the interposition of a ½-undulation plate, which converts plane into circularly polarised light, was then shown, and Mr. Spottiswoode also interposed a concave plate of quartz, and exhibited the effect of rotation on the characteristic rings of quartz.—Prof. Adams exhibited a polariscope adapted for showing the optic axes of crystals in which they are much inclined to each other, as in the case of topaz. The part of the instrument by which this is effected consists of a frame in which the crystal is supported between two hemispherical lenses, the common centre of which is at the centre of the crystal. The frame is capable of motion round an axis at right angles to that of the instrument. By this means each of the axes can be brought under the cross wires, and the space through which the frame is moved affords a means of determining the angle between the axes of the crystal. The crystal may be immersed in a liquid in cases in which its optic axes are too far apart to be seen in air.—Dr. Mills made a verbal communication on fusion-point and thermometry. His apparatus for fusion-points consisted essentially of a beaker, in which stood an inverted funnel, the shortened stem of which carried a test-tube, supported by a contraction at its base. The test-tube contains naphtha of high boiling-point, and the thermometer and capillary tube containing the substance occupy its centre; the funnel has four equidistant semicircular cuts at the end of its stem, and six on its lips; the beaker is nearly filled with strong oil of vitriol, and has a wooden cover; on the application of heat below the beaker, warm oil of vitriol ascends in the funnel, and cold oil of vitriol descending, enters at the lip; thus an automatic stirring is kept up, and the mercury in the thermometer rises so regularly as to appear perfectly continuous in course, even under considerable magnifying power. The manner of preparing and filling the capillary tubes was described. Attention was then drawn to the "zero error" of thermometers. In thermometers which have not been much used, the zero error must always be determined immediately after experiment. It is also generally necessary to correct for the projection of the thermometer beyond its bath. This correction has been experimentally determined by the author, and required from 1,500 to 2,000 observations of temperature for each of four instruments used. It was ascertained that the well-known expression—

$$C = \cdot 0001545\ (T - t)N$$

given by Regnault and Kopp is not supported by actual trial. If we write the expression thus—

$$C = x(T - t)N$$

experiment shows that x depends on the length N exposed, and

$$x = \alpha + \beta N$$

For lengths of about 25°, x is about ·00013, and increases about ·0001 for every additional 25°. The exact values of α and β require, however, to be ascertained for each instrument.—Mr. Bauerman, F.G.S., described and illustrated a very simple method for ascertaining the electric conductivity of various forms of carbon. The method, which was originally devised by Dr. von Kobell, consists in holding a fragment of the substance to be tested with a strip of zinc bent in a U-form, and immersing it in a solution of copper sulphate. In the case of a bad conductor a deposit of copper takes place solely on the surface of the zinc, but when a good conductor is employed a zinc-carbon couple is formed, and a deposit takes place on the surface of the carbon. Numerous specimens were exhibited which showed that the conducting power is greatest in coal which has been subjected to a great degree of heat, and the lowest temperature at which this change takes place appears, in the case of anthracite, to be between the melting points of zinc and silver. Such experiments appear to be specially important as giving a clue to the temperature at which anthracitic metamorphism has been effected by the intrusion of igneous rock.—Prof. Woodward exhibited an apparatus for building up model cones and craters. It consists of a wooden trough about 18 inches long, with sloping sides; at the bottom of the trough a bladed screw carries forward the ashes, sawdust, or other material used, to an opening through which air from a powerful bellows is forced upwards. A board 3 or 4 feet square, with a hole in the centre, is placed over the air-jet, and on this the crater is formed. Several of the peculiarities of natural cones may thus be illustrated, and their structures shown, by using sawdust of various colours.

WELLINGTON, N.Z.

Philosophical Society, Feb. 10.—Dr. Hector, F.R.S., in the chair.—The annual report by the Council (adopted as read) congratulated the Society upon its prosperous condition, not only in regard to the great increase in the number of members, but upon the growing interest taken in the work of the Society, as indicated by the large attendance at the meetings of the past session, and by the number of interesting papers read and dis-

cussed by members. There are now 161 names on the books, twenty-two new members having been elected since January 1874. Seven general meetings were held, and thirty-two papers read on the following subjects:—*Geology.*—1. Did the Great Cook River run N.W. or S.E.? Mr. Crawford. 2. On the Tertiary Series of Wanganui, Mr. Purnell. 3. On the microscopic structure of the igneous rocks of New Zealand, Richard Daintree. 4. On the Pleistocene glaciation of New Zealand, Mr. Travers. 5. Changes in the physical geography of New Zealand since the arrival of the Maoris, Mr. Hood. *Zoology.*—1. Description of fish, presented to the Museum by Prof. Wyville Thomson, Dr. Hector. 2. On new fish from Chatham Islands, Dr. Hector. 3. On certain disputed points in New Zealand Ornithology, Dr. Buller. 4. On New Zealand whales, Dr. Hector. 5. On *Plotus novæ hollandiæ*, Dr. Buller. *Botany.*—1. On a new species of *Rubus*, by Mr. Buchanan. 2. On the durability of New Zealand timber, Mr. Buchanan. 3. On *Juncus camprocarpus* and a new species of Isoetes, Mr. Kirk. 4. On new species of mosses, Dr. Knight. 5. Flowering plants and ferns of Chatham Islands, Mr. Buchanan. 6. Description of New Zealand lichens, Dr. Knight. 7. Two plants new to New Zealand, *Lepilæna preissii* and *Carex chlorantha*, Mr. Kirk. *Meteorology.*—1. On solar radiation in New Zealand, Mr. Rous Marten. 2. On the hot winds of Australia and their influence on the climate of New Zealand, Mr. Hood. 3. On the hot winds of Canterbury, Mr. M'Kay. *Chemistry.*—Five papers pointing out certain new discoveries in chemistry, Mr. Skey. *Miscellaneous.*—1. On ergot in rye, Dr. Hector. 2. On portion of a wreck found at the Haast River, Capt. Turnbull. 3. On the identity of the Moa hunters with the present Maori race, Mr. M'Kay. 4. On Maori traditions respecting the Moa, Mr. Hamilton. 5. On the longitude of Wellington Observatory, Capt. Nares, of H.M.S. *Challenger*. 6. On the Duplex system of telegraphy, Mr. Lemon. These papers will all appear in the seventh volume of the "Proceedings and Transactions of the New Zealand Institute," which is now going through the press. The balance-sheet showed a credit of 162*l.*, of which Dr. Hector was requested to expend 100*l.* in purchasing standard works of reference in England.—The Chairman announced that Prof. Wyville Thomson, Prof. Newton of Cambridge, and Robert M'Lachlan, all of whom had taken great interest in New Zealand science and added much to its literature, had been elected honorary members of the New Zealand Institute. Dr. Buller, F.C.S., F.G.S., was elected president for the ensuing two years. Mr. Travers, F.L.S., vice-president, then took the chair, and the following papers were read:—Further proofs of the former existence of the Great Cook River, by J. C. Crawford, F.G.S.—Notes on Hutton's "Catalogue of Marine Mollusca of New Zealand," by Dr. Ed. von Martens.—On some additions to the collection of birds in the Colonial Museum, by Dr. Buller.—Additional notes on New Zealand fishes, by Dr. Hector.—Further notes on New Zealand whales, by Dr. Hector.—Mr. Travers said that the visit of Dr. Hector to Europe with a valuable collection of specimens of natural history and other objects would materially advance the cause of science in New Zealand.

PHILADELPHIA

Academy of Natural Sciences, Sept. 15, 1874.—Dr. Ruschenberger, president, in the chair.—Prof. Leidy made some remarks on the moving power of diatomes, desmids, and other Algæ. While the cause of motion remains unknown, some of the uses are obvious. The power is considerable, and enables these minute organisms, when mingled with mud, readily to extricate themselves and rise to the surface, where they may receive the influence of light and air. In examining the surface-mud of a shallow rainwater pool, in a recent excavation in brick clay, he found little else but an abundance of minute diatomes. He was not sufficiently familar with the diatomes to name the species, but it resembled *Navicula radiosa*. The little diatomes were very active, gliding hither and thither, and knocking the quartz sand-grains about. Noticing the latter, he made some comparative measurements, and found that the Naviculæ would move grains of sand as much as twenty-five times their own superficial area, and probably fifty times their own bulk and weight, or perhaps more.—Dr. J. Gibbons Hunt remarked that in the vegetable kingdom it is exceedingly rare to meet with glands which have distinct excretory ducts. Some authors deny their existence entirely; but in *Nepenthes rafflesiana*, *N. distillatoria*, and *N. phyllamphora*, and probably in all the species, are large cylindrical glands which pour out their secretion through distinct excretory ducts.

PARIS

Academy of Sciences, May 20.—M. Frémy in the chair.—The following papers were read:—Observations of the moon, made with the meridian instruments of the Paris Observatory during 1874, communicated by M. Leverrier.—Some remarks on the discussion with regard to cyclones, by M. Faye.—Researches on sun-spots and solar protuberances made during the years 1871 to 1875, by Father Secchi.—Conditions of the maximum amount of work produced by heat-engines, by M. A. Ledieu.—M. André read a paper on the scientific results obtained at Nouméa by the Transit party.—On the determination of singularities of the left curve, at the intersection of two surfaces of any order that have a certain number of multiple points in common, by M. L. Saltel.—A note by M. V. Cornil, on the dissociation of the violet of methylaniline and its separation into two colours under the influence of normal and pathological tissues, particularly by tissues inclined to amyloid degeneration.—Application of the graphical method to the study of the mechanism of swallowing, by M. S. Arloing.—On a new proceeding in the operation of the cataract (extraction by means of a peripherical piece of cloth), by M. L. de Wecker.—Sulphuration of copper and of iron by a prolonged presence in the thermal source of Bourbon-l'Archambault, by M. de Gouvenain.—On the wanderings of the oak Phylloxera, by M. Lichtenstein.—On some reactions of chromium salts, by M. A. Etard.—On Camphenes, by M. J. Riban.—A note by MM. C Saint-Pierre and G. Jeannel, on a reaction of carbon bisulphide; conversion of carbon bisulphide into hydro-sulphocyanic acid.—On the influence of the pressure in the atmosphere upon the life of man, by M. Cl. Bernard.—Researches on the respiration of birds, by the same and M. Campana.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—The Pebbles in a Bolton Brick field. A Lecture by Rooke Pennington, B.A., LL.D. (*Bolton Daily Chronicle*).—Report of the Rugby School Natural History Society for 1874.—Notes on the Fertilisation of Cereals (Botanical Society of Edinburgh).—On the Graphical representation of the movements of the Chest Wall in Respiration: A. Ransome, M.D., M.A. (Taylor and Francis).—Arctic Papers for the Expedition. A selection of Papers on Arctic Geography and Ethnology. Printed and presented to the Arctic Expedition of 1875 by the Royal Geographical Society (John Murray).—A Compendious Statement of the Nature and Cost of certain Sewage Processes: Major-General Scott, C.B.—Ornithology of the Straits of Gibraltar: Lieut.-Col. L. Howard and L. Irby, F.Z.S. (R. H. Porter).—Contributions to Natural History and Papers on other Subjects: James Simpson (Edinburgh Publishing Company).—Recreative Science: David Page, LL.D. (Wm Blackwood).—Transactions of the Norfolk and Norwich Naturalists' Society, 1874-75. Vol. ii. Part i.—The Potato Disease: Eccles Haigh (G. Philip and Son).—Chapters on Sound: C. A. Martineau (Sunday School Association).—The Zoological Record for 1873 (John Van Voorst).

COLONIAL.—General Report on the Operations of the Great Trigonometrical Survey of India during 1873-74: Col. J. T. Walker, R.E., F.R.S., &c., Superintendent of the Survey (Dehra Dun, M. J. O'Connor).—Proceedings of the Annual Meeting of the Members of the Agri-Horticultural Society of Madras on the 24th and 27th of March, 1875.

AMERICAN.—Centrifugal Force and Gravitation. Part I.: John Harris (Lovell Printing and Publishing Company).—The Surface Geology of Ohio, U.S. (Columbus, O.; Nevins and Myers).

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